JET STREAMS

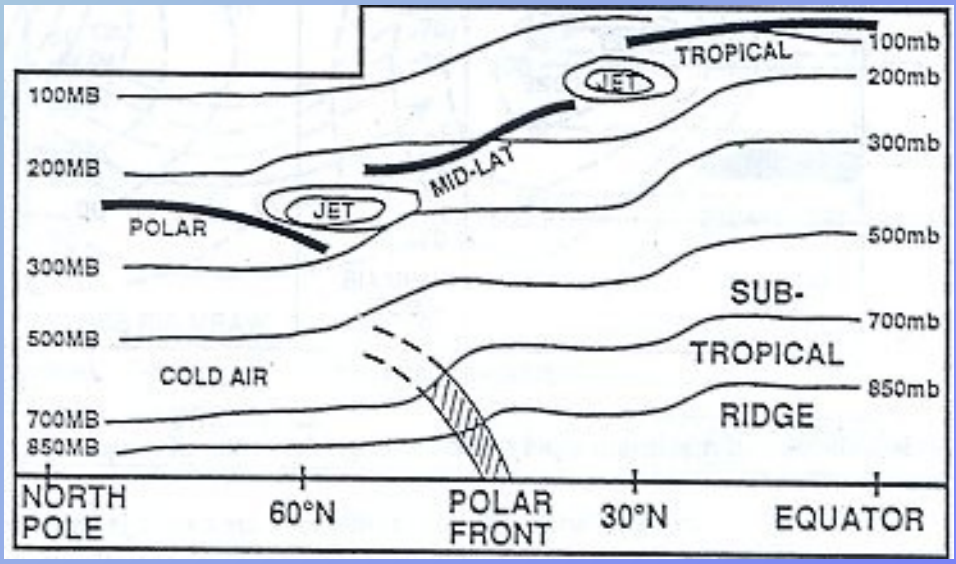
- Defined:
  - Relatively strong, quasi-horizontal winds concentrated within a narrow air current in the upper troposphere
  - Typically winds are $\geq$ 50 knots

Causes

- Polar Front Jet
  - Strong horizontal temperature contrast
- Subtropical Jet
  - Convergence between the Hadley and Ferrel Cells

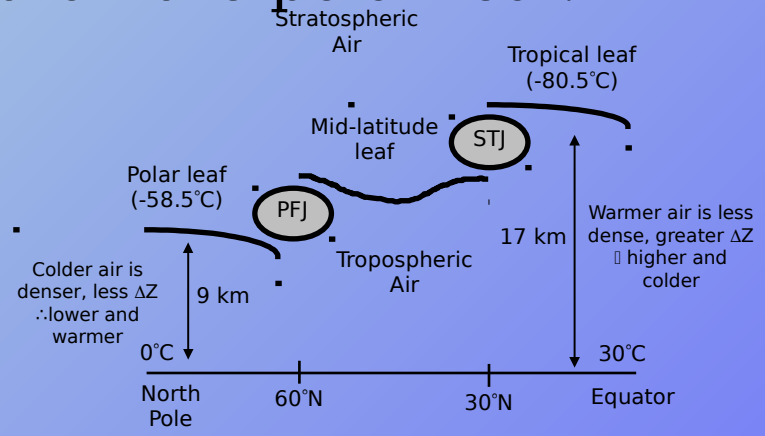
Characteristics

- Tropopause tends to be discontinuous in 2 areas:
  - Near the polar front
  - Over the subtropical ridge



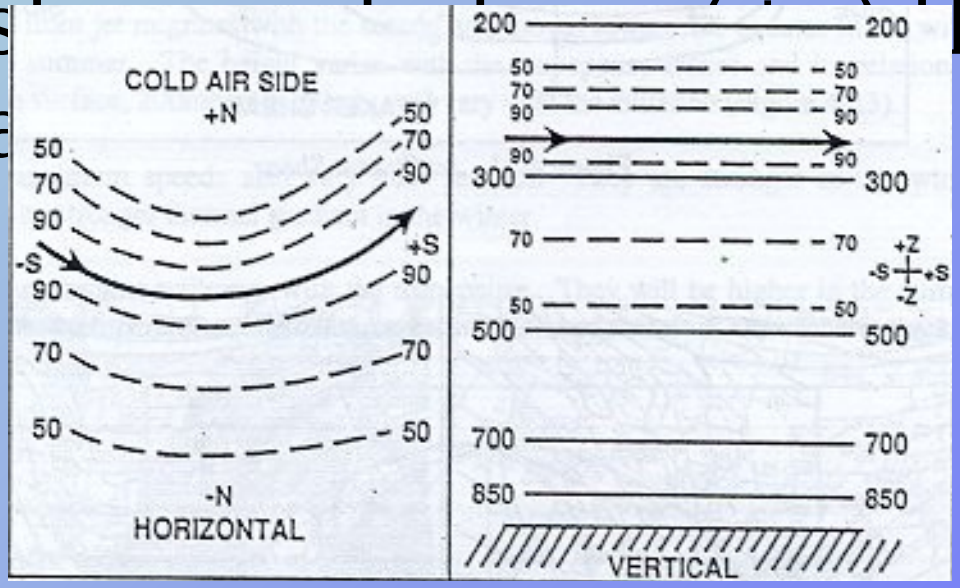
Characteristics

- Tropopause Leaves
  - The first leaf is the tropical leaf, which is located equatorward of 30° North and 30° South latitude. The tropical leaf is the highest and, therefore, the *coldest* of the three leaves.
  - The northernmost leaf is the polar leaf, located poleward of 60° latitude. This is the lowest and, therefore, *warmest* leaf.
  - The mid-latitude leaf lies between 30° and 60° latitude; it is lower than the tropical leaf, but higher than the polar leaf.



Physical Structure

- In the horizontal, isotach gradients are the strongest on the cold air side (+n)
- In the vertical, isotach gradients are s he jet strea

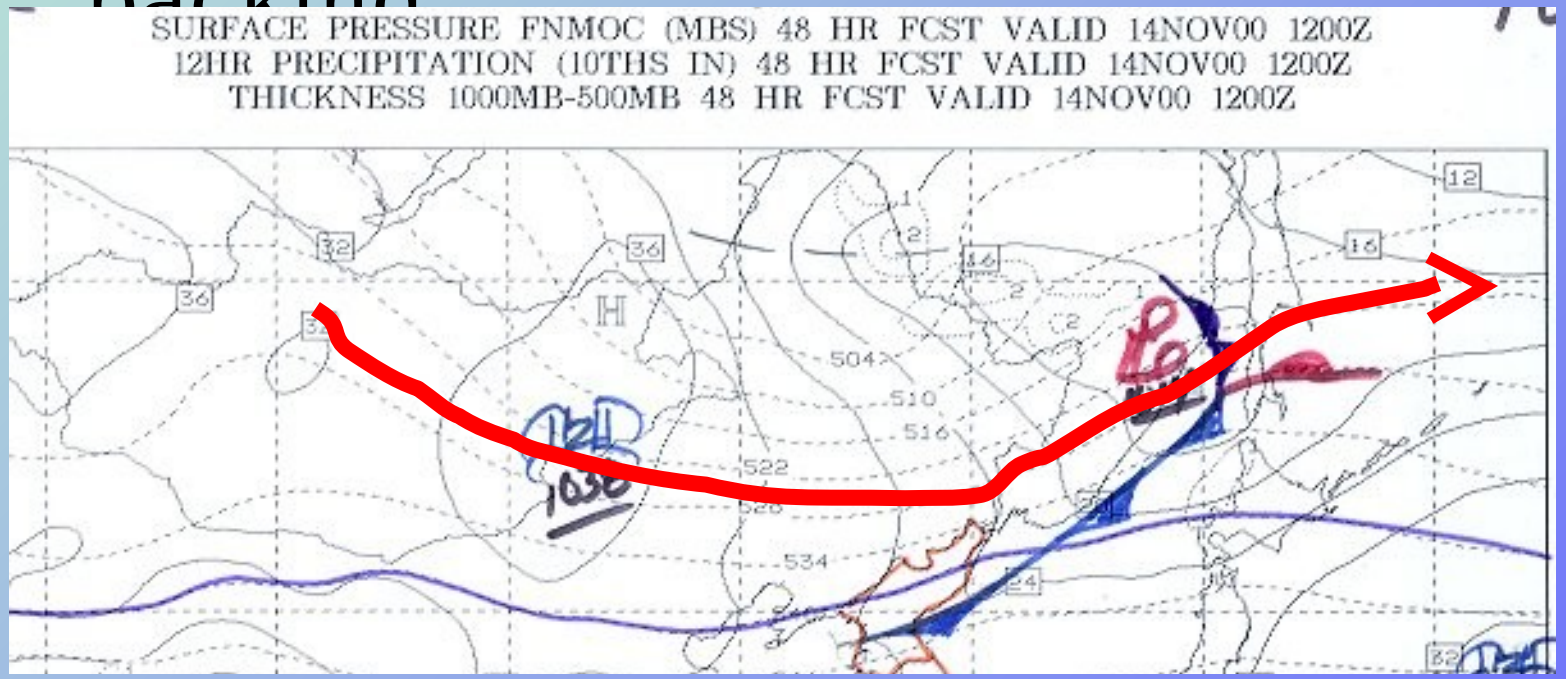


Polar Front Jet (PFJ)

- Primary cause is horizontal temperature contrast
- Migrates with seasons (equator ward in winter/poleward in summer
- Jet maximum speeds vary with seasons (stronger in winter)
- Jet core heights vary with seasons
  - Higher in summer (40,000’)
  - Lower in winter (24,000 to 30,000)

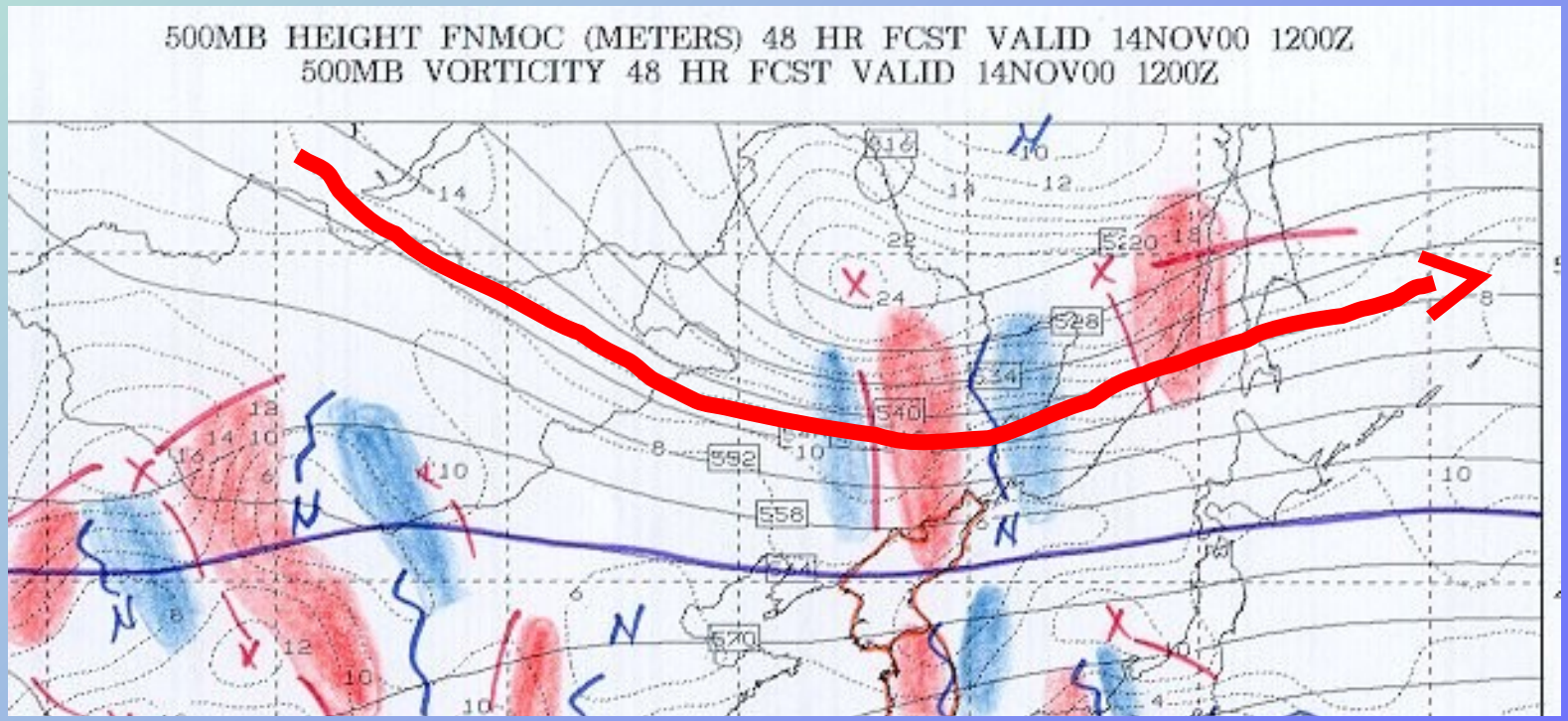
Polar Front Jet Identification

- Located above tightest thickness packing



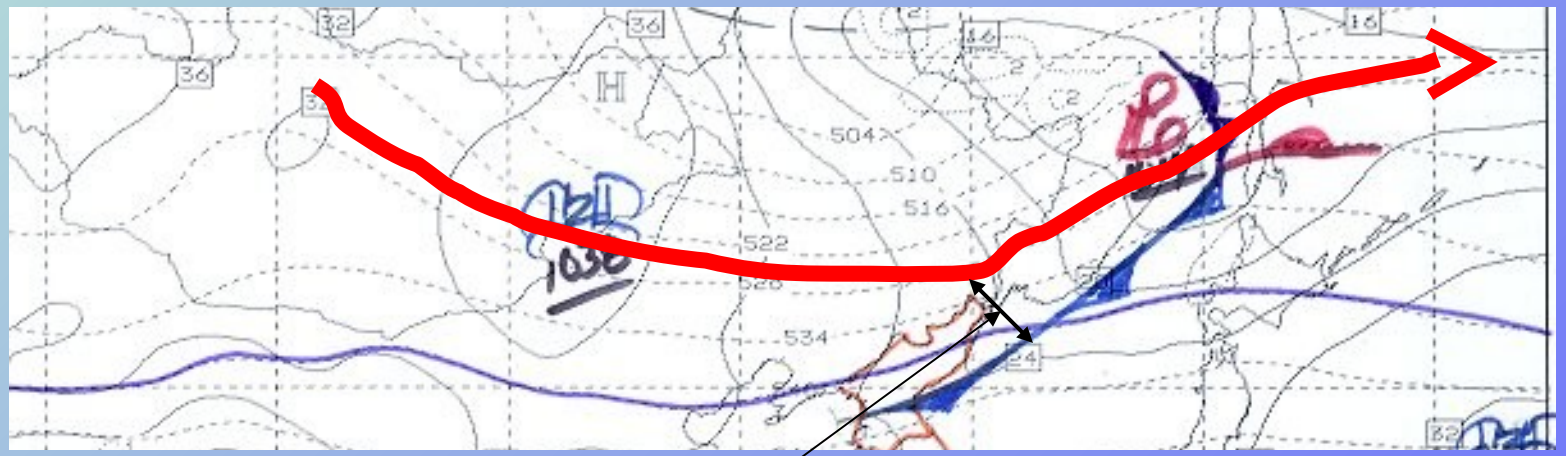
Polar Front Jet Identification

- Found above the strongest 500mb contour gradient.



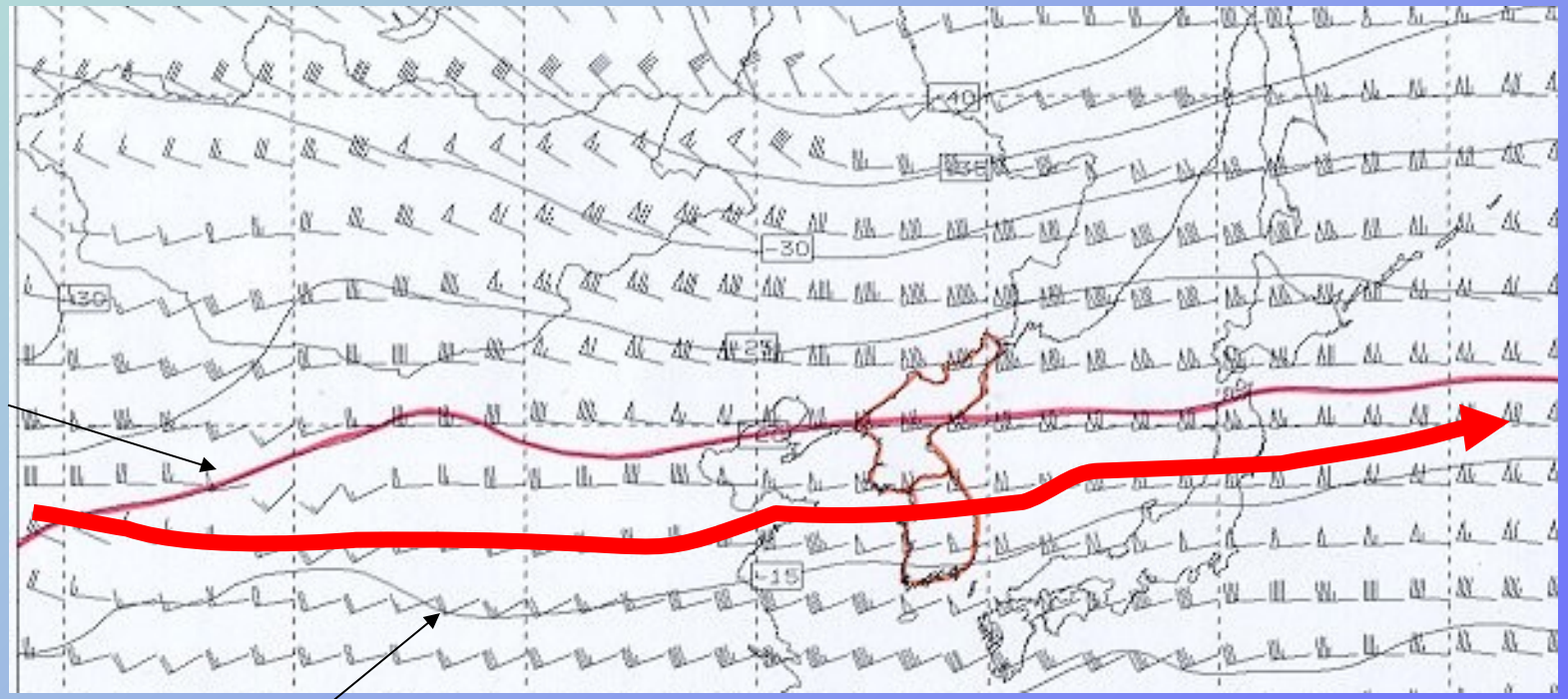
Polar Front Jet Identification

- PFJ is generally found 300 to 350nm (5-6^{o} latitude) on the cold air side of the polar front.



Polar Front Jet Identification

- PFJ is often found above the –17°C isotherm on the 500mb chart

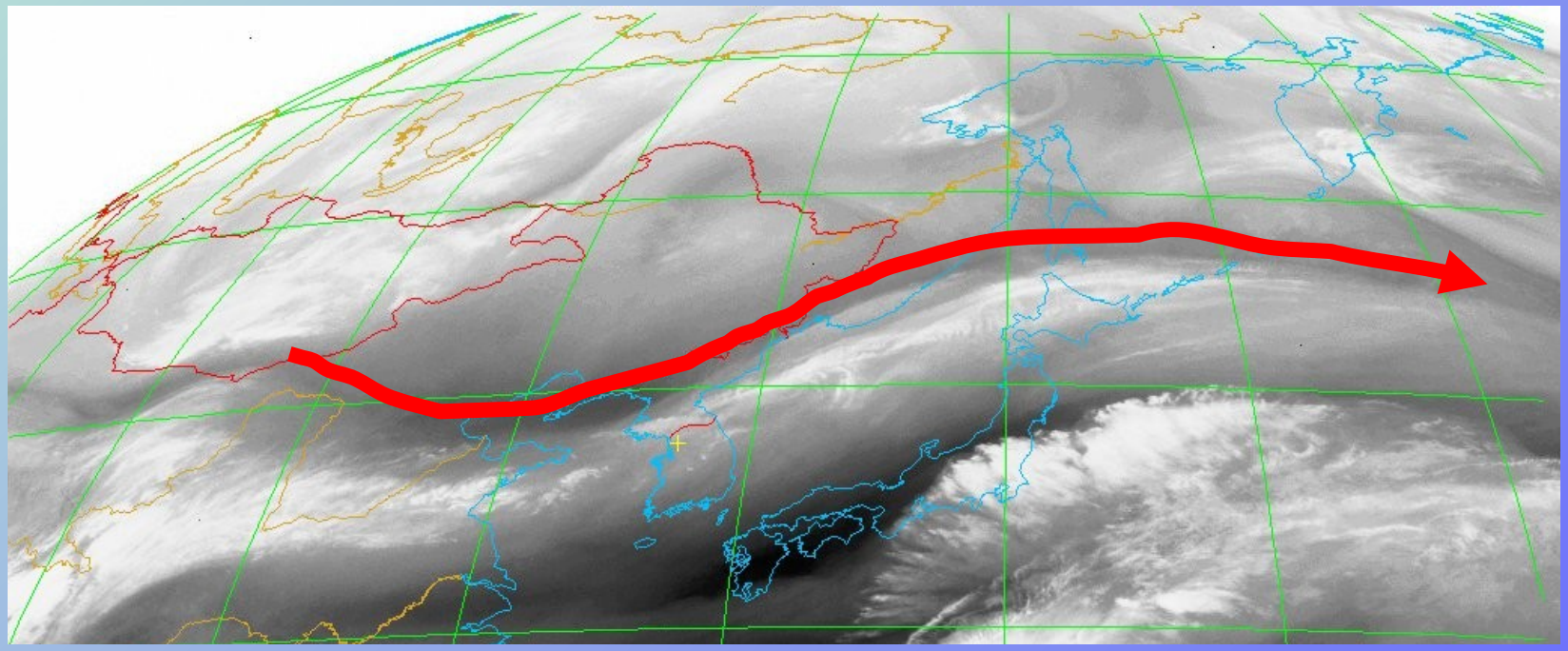


-20°C

-15°C

Polar Front Jet Identification

- Cirrus cloud decks tend to form or persist on the warm side of the jet stream axis.



Polar Front Jet Identification

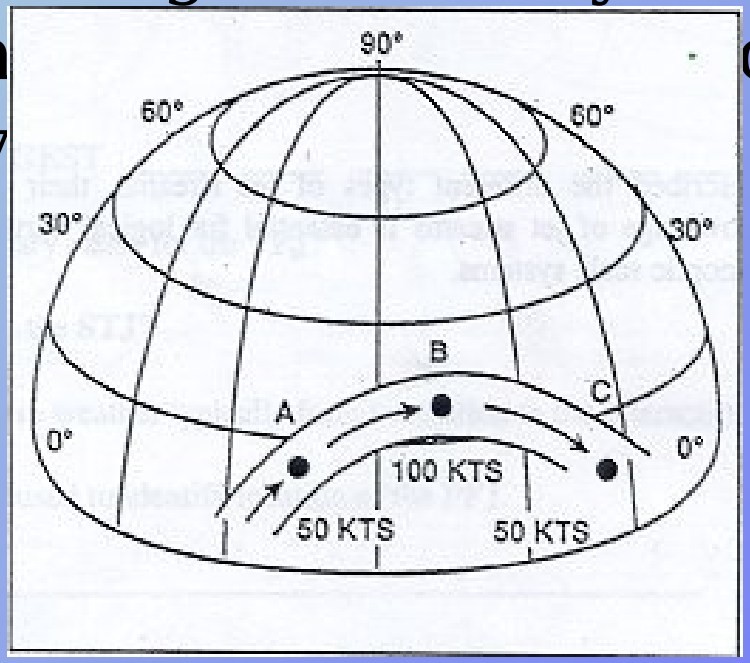
- Final interpretation should consider all rules listed previously
- Due to 3 jets over our AO in winter (northern and southern branches of the AFJ/PFJ, and the sub-tropical jet, looking for the max wind band (jet core) typically doesn’t work well.
  - Shared energy from the 3 jets will distort placement
  - Use thickness, 500mb contour gradient, 500mb thermal pattern, and water vapor to place your jets.

Sub Tropical Jet (STJ)

- Primary cause is convergence aloft between the Hadley and Ferrel Cells
- Secondary cause is horizontal temperature contrast
- Location is generally between 25° and 35° latitude with a mean latitude of 28° – can be seen north of 40° in the summer months over eastern Asia.
- Conservation of angular momentum is a factor in accelerating the STJ.

Sub Tropical Jet (STJ)

- Conservation of angular momentum:
  - If mass is held constant, and the radius changes, velocity must change so the a can be conserv



Subtropical Jet Identification

- Located above the –11^{o}C isotherm on the 500mb chart
- Mean Latitude of 28^{o}
- Jet cirrus is normally found on the warm air side in the form of transverse bands
- Strongest wind band on 200mb chart
  - Consider shared energy in a scenario where the PFJ is strong and at a southern latitude
- Located near/over the sub-tropical ridge